Gary P. Hansen
Vice President of Engineering

R-152a Off Highway Field Evaluation Project

An Update of the MACS, EPA, & RED DOT Joint Development Partnership for the Use of Alternative Refrigerants in Heavy Duty and Off Highway Vehicle Applications

Our Marketplace

Red Dot's Current Direction

- **Develop Product Technology that can be used as Enhanced R-134a (IMAC) Systems and take Advantage of R-152a in the future.**
- **Orlando Florida, January 22, 2004**
  - Red Dot Corporation announces the introduction of the first mobile air conditioning system to use HFC-152a refrigerant.

R-152a Program Update

R-152a Program Update

- **October 14, 2004**
  - A compromise is reached between the European Parliament and the European Commission.
    - Phase out of R134a on all new vehicles in 2011.
    - GWP of 150 or less, making R-152a acceptable.

R-152a Program Update

- **October 14, 2004**
  - A compromise is reached between the European Parliament and the European Commission.
    - Phase out of R134a on all new vehicles in 2011.
    - GWP of 150 or less, making R-152a acceptable.
- **February 21, 2005**
  - EPA Assists in Funding Australian Field Test Project
    - A $50,000 contract is issued to Red Dot.

Australian Field Trials

- 10 R-9728 R-152a Rooftop A/C units are currently under construction.
- 5 units will be placed in off highway/mining applications in Western Australia
- 5 units will be placed in off highway applications in Northern Australia

Australian Government
Australian Greenhouse Office

R-9728 Rooftop A/C Platform

- Based on the R-9727 series Heavy Duty Rooftop A/C
- Cooling Performance
  6.4 kW with 2.2℃
- (22,000 BTU/Hr w/ 36℉)

R-9728 Rooftop Design Features

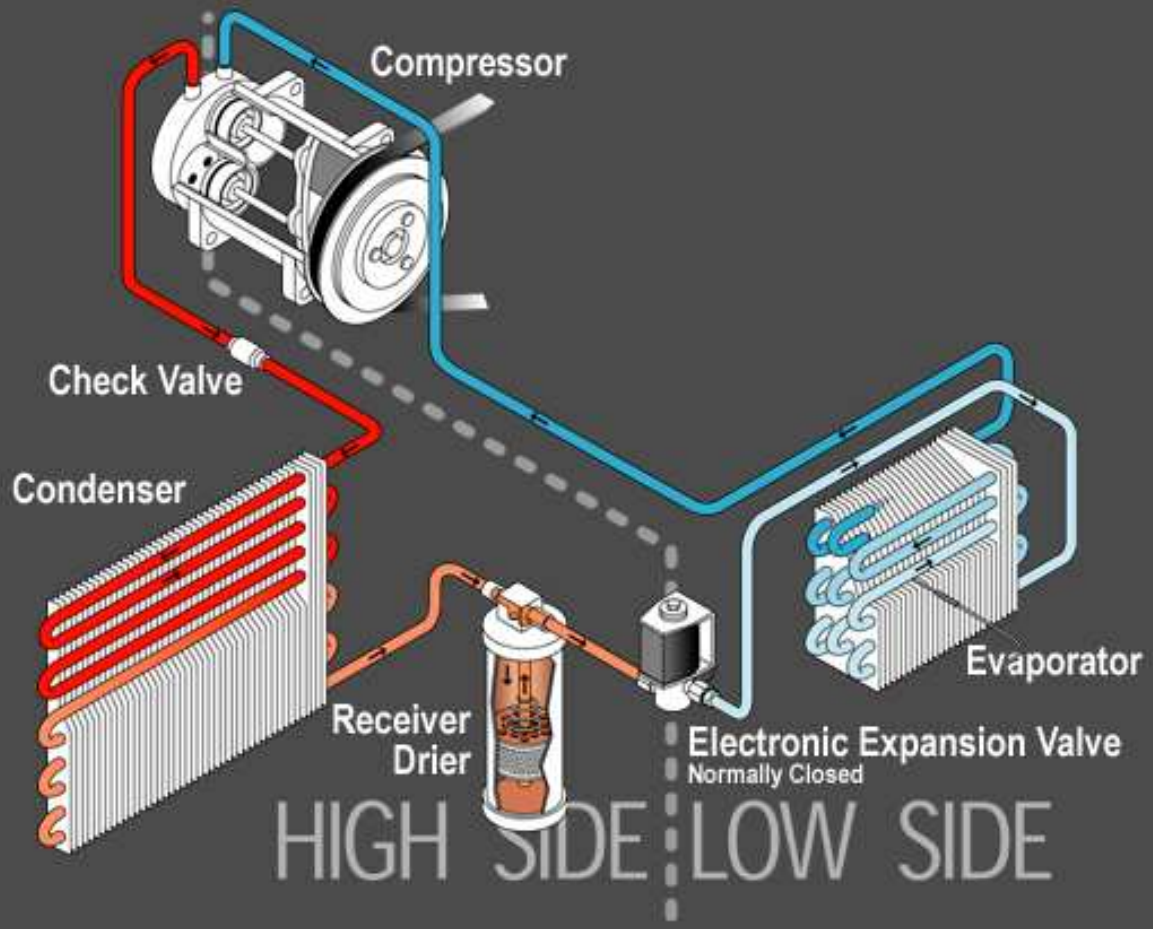
- Hydraulic Driven Compressor
- Limited Connections
- Solid Tube Refrigerant Lines

R-9728 Rooftop A/C

- **Refrigerant Charge Levels:**
  - R-134a = .9 kg (2 lbs)
  - R-152a = .6 kg (1.3 lbs)
- **Can be Pre-Charged**

Australian Government
Australian Greenhouse Office

R-9728 Direct Expansion System



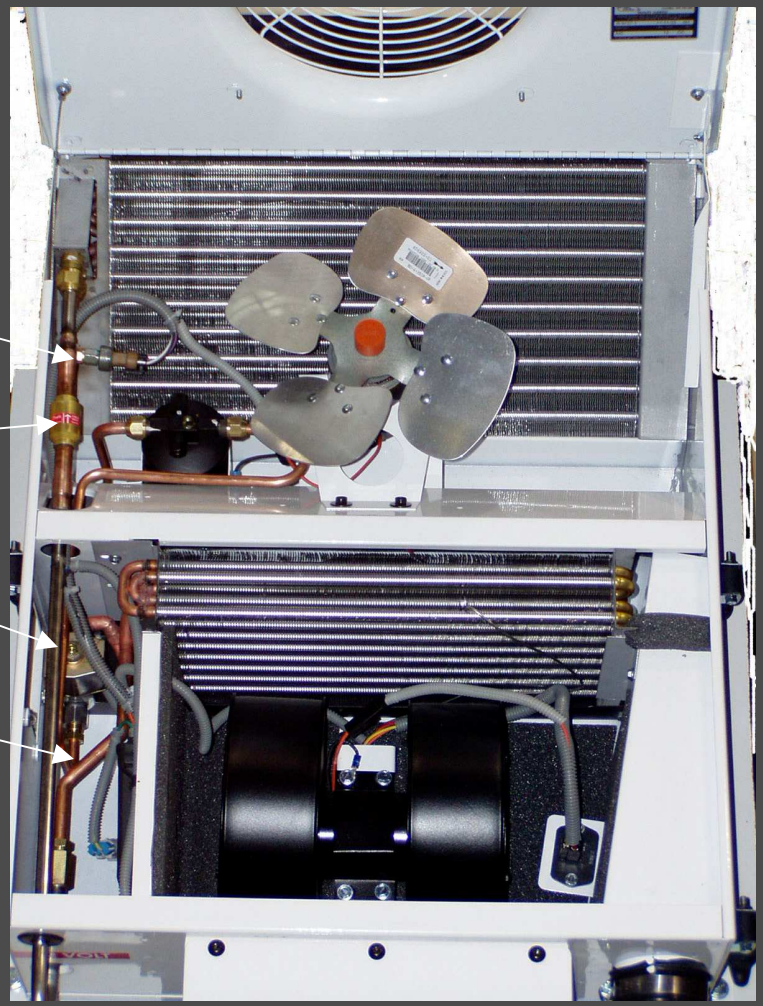
R-9728 Component Layout

High Side Sensor

Check Valve

Block TXV

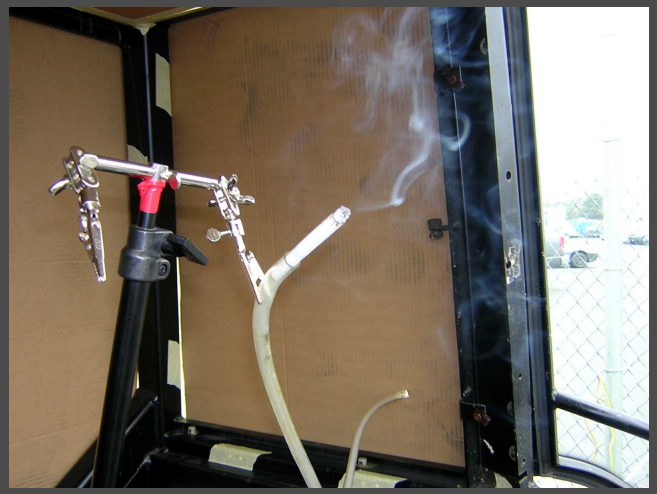
Refrigerant Solenoid



Safety Considerations

- Reduced Refrigerant Charge
- “Pump Down” Feature upon Shutdown
- Refrigerant Connections Isolated from Cabin Air Stream
- Integrated Cab Pressurizer

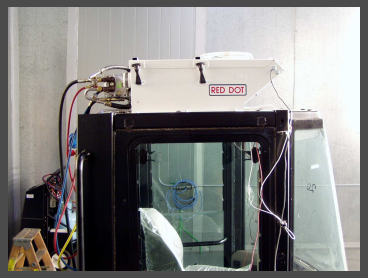
Safety Tests

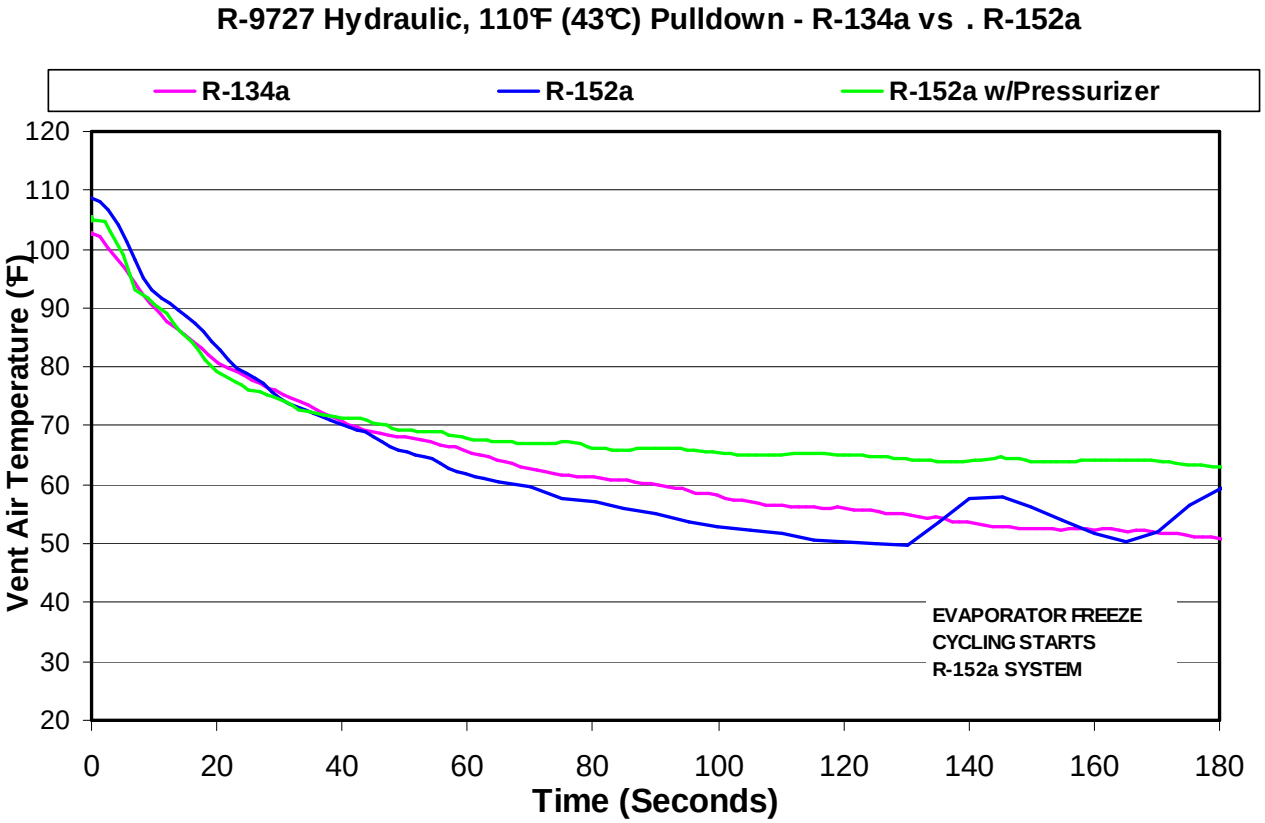


Safety Tests

Australian Government
Australian Greenhouse Office

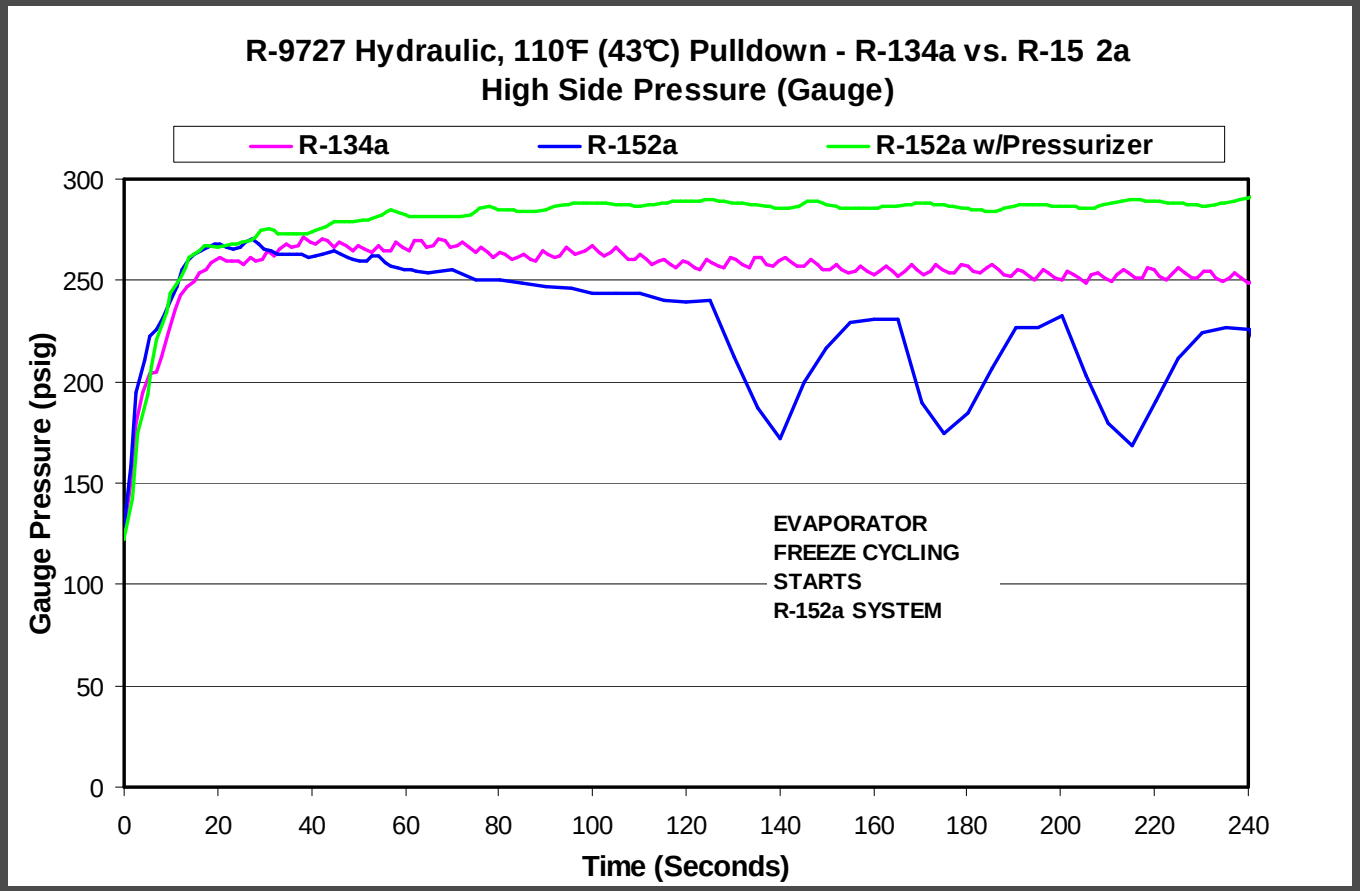
R-152a Cooling Comparison





Australian Government
Australian Greenhouse Office

R-152a Head Pressure Comparison



Development Partners

- Sanden (USA) International - Compressors
- Twin Rivers Engineering - Gas Sensing & Leak Detection
- Yellow Jacket – Charge & Reclaim Equip.
- Interdynamics – Field Charging Equip.
- Techven (USA) LLC- Refrigerant
- Technical Support
  - EPA
  - MACS
  - SAE

Next Steps

- **Lab and Durability Testing at Red Dot**
  - Completed October 2004
- **Safety and Economy Testing**
  - Completion Date April 30, 2005
- **Construct and Install Prototypes for Australian Field Tests:**
  - 10 Prototype Build Complete – April 15, 2005
  - Australian Installs – June 2005
- **Present Results**
  - Initial Report – MACS 2006
  - Full Report – March 31, 2006

BUILT TO SURVIVE!

THANK YOU!